

SECTION 15112
COMPRESSED AIR PIPING (PLANT AIR) SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

- A. This Section includes piping or tubing materials for general shop or plant air service with 150°F (65°C) maximum temperature and 150-psig maximum pressure for both above and below grade applications.
- B. Related Sections:
 - 1. Section 15050, Piping Systems.
 - 2. Section 15072, Cleaning.
 - 3. Section 15073, Pressure/Leak Testing.
 - 4. Section 15074, Identification and Labeling.
 - 5. Section 15100, Valves.

1.3 REFERENCES

- A. American Society of Mechanical Engineers (ASME)
 - 1. ASME B16.1-98, Cast Iron Pipe Flanges and Flanged Fittings
 - 2. ASME B16.3-99, Malleable Iron Threaded Fittings
 - 3. ASME B16.39-98, Malleable Iron Threaded Pipe Unions
 - 4. ASME B16.18-84, Cast Copper Alloy Solder Joint Drainage Fittings, DWV
 - 5. ASME B16.24-91, Cast Copper Alloy Pipe Flanges & Flanged Fittings: Class 120, 300, 400, 600, 1500 & 2500
 - 6. ASME B16.22-89, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
 - 7. ASME B31.9-96, Building Service Piping
- B. American National Standards Institute (ANSI)
 - 1. ANSI B16.21-92, Nonmetallic Flat Gaskets For Pipe Flanges
- C. American Society for Testing and Materials (ASTM)
 - 1. ASTM B16-92, Standard Specification for Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines
 - 2. ASTM B75-93, Standard Specification for Seamless Copper Tube
 - 3. ASTM B88-93a, Standard Specification for Seamless Copper Water Tube
 - 4. ASTM B124-89, Standard Specification for Copper and Copper-Alloy Forging Rod, Bar, and Shapes

1.4 DEFINITIONS

- A. Dry, oil-free, Compressed Air (CA); general services (plant air) compressed air, oil-free, with -40°F to -75°F dew point at atmospheric pressure.

1.5 SUBMITTALS FOR APPROVAL

- A. Test records for the compressed air piping system shall be prepared during pressure/leak testing, indicating date of test, identification of piping system tested, test media, test pressure, and certification of results.
- B. Field Test Reports: Provide written reports of tests specified in Part 3 of this Section. Report shall include the following:
 - 1. Summary of "holiday" test results.
 - 2. Test procedures used.
 - 3. Test results that comply with requirements.
 - 4. Failed test results and corrective action taken to achieve requirements.

1.6 QUALITY ASSURANCE

- A. Prepare test records for the compressed air piping system during pressure/leak testing, including date of test, identification of piping system tested, test media, test pressure, and certification for both CA and IA system results. Individual test records need not be retained if overall certification that both piping systems have satisfactorily passed cleanliness and pressure/leak testing is submitted.

1.7 SEQUENCING

- A. Perform testing after completion of installation.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. PLANT AIR SYSTEM (Above grade)
 - 1. Provide compressed-air piping and components complying with ASME B31.9, "Building Services Piping." Operating pressure of 125-psig (860 kPa) or less and temperature of 200 deg. F (93.3 deg. C) or less. . All materials shall be non-oiled or cleaned to be oil free prior to installation.
 - 2. Copper Tube: ASTM B 88, Type L (ASTM B88M, Type B), Seamless, water-tube, hard-drawn tempered, non-oiled, or Stainless-Steel Pipe: ASTM A 312 (ASTM A 312M), Schedule 5, with plain ends.
 - a. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - b. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
 - c. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to metal seating surfaces and solder-joint or threaded ends.
 - d. Gaskets: Nonasbestos, red rubber sheet, ASTM D2000 M2AA 507 A13, 1/16-inch-thick, full face, ANSI B16.21; SEPCO Style 20.
 - e. Bolts: Steel, heavy hex head, ASTM A307 Grade B.
 - f. Nuts: Steel heavy hex head, ASTM A563 Grade B.Soldered Joints: Use ASTM B813, water-flushable, lead-free flux; and ASTM B 32, lead-free-alloy solder; unless otherwise indicated.
 - 3. Vic-Press 304 Stainless Steel Piping System (1/2" to 2"):
 - a. Pipe: Victaulic stainless steel Vic-Press 304 pipe, ASTM A-269, grade 304/304L, .049 walls, certified for use with Vic-Press 304 stainless steel products.

- b. Fittings: Victaulic stainless steel Vic-Press 304 fittings, formed from austenitic stainless steel.
 - c. Couplings: Housing body precision cold drawn austenitic stainless steel with self-contained o-ring seals in the coupling ends.
 - d. Flanges: 304 stainless steel ends with DI backing ring, Victaulic Style 565 Van Stone flange adapter, class 150.
 - e. Valves: Brass body forged to ASTM B-16, chrome plated brass ball, with TFE seat. Victaulic Series 589 ball valve.
4. Optional materials: (All materials shall be non-oiled or cleaned to be oil free prior to installation.)
- a. Steel: ASTM A 53, Type E, Electric-Resistance Welded or Type S, Seamless, Grade B, Schedule 40, non-oiled black steel.
 - b. Fittings (to NPS 2): Malleable iron, ASTM A 197, threaded, ASME B16.3 Class 150, non-oiled.
 - c. Fittings (NPS 2 ½ to NPS 12): Cast iron, ASTM A126 Class A or B, flanged ends, ASME B16.1 Class 125, non-oiled or shall be grooved, non-oiled, ductile iron conforming to ASTM A 395, Grade 65-45-15 or non-oiled, ductile iron conforming to ASTM A 536, Grade 65-45-12.
 - d. Grooved Couplings and Flanges: Ductile iron conforming to ASTM A-536, non-oiled.
 - e. Unions (to NPS 2): Malleable iron, non-oiled, ASTM A197, threaded, brass-to-iron seats, ASME B16.39 Class 150, galvanized.
 - f. Flanges (NPS 2 ½ to NPS 12): Cast iron, ASTM A126 Class A or B, threaded companion, ASME B16.1 Class 125, smooth or serrated face per MSS SP-6, galvanized.
 - g. Gaskets: Non-asbestos, red rubber sheet, ASTM D2000 M2AA 507 A13, 1/16-inch-thick, full face, ANSI B16.21; SEPCO Style 20.
 - h. Bolts: Steel, heavy hex head, ASTM A307 Grade B.
 - i. Nuts: Steel heavy hex head, ASTM A563 Grade B.
 - j. Caps (to NPS 2): Malleable iron, non-oiled, ASTM A197, threaded, ASME B16.3 Class 150, galvanized.
 - k. Joint Compound: PTFE thread seal tape SEPCO.
5. VALVES: For valve descriptions see Section 15100.

<u>Service:</u> Shutoff	<u>Size</u> (inches)	<u>Valve</u> Number	Valve End Type
Butterfly (Ductile)	2-1/2" to 12"	V-6483	Grooved
Ball (Bronze)	1/2" to 2"	V-6468	Screwed
Ball (Carbon steel)	1/2" to 2"	V-6168	Screwed
Ball (Carbon steel)	3" to 10"	V-6189	Flanged
Ball (Stainless steel)	1/2" to 2"	V-1181A	Flgd./Welded
Ball (Brass body)	1/2" to 2"	V-6470	Press-Fit
Ball (Stainless body)	1/2" to 2"	V-6177	Press-Fit

- B. PLANT AIR SYSTEM (Below grade)
1. Steel piping: ASTM A 53, Type E, Electric-Resistance Welded or Type S, Seamless, Grade B, Schedule 40, non-oiled black steel.
 2. Piping shall be a totally pre-manufactured system. All straight sections, fittings and other accessories shall be factory prefabricated to job dimensions and designed to minimize the number of field connections.
 3. Contractor fabricated systems, whether fabricated on site or off site, shall not be acceptable.

4. Trained facility representatives of the piping supplier shall provide technical field support and assembly training prior to piping installation to insure that field applied protective coating, applied at assembly joints, is installed to factory standards.
5. The contractor shall supply a complete proposed installation submittal including layout drawings and catalog sheets. Submittal shall detail location of assembly joints, pipe elevations, pipe anchor locations, details for field applied protective coatings at assembly joints, fittings and anchor plates.
 - a. Any proposed installation which indicates deviation in the pipe length, installed elevation, routing or anchor location, from that which is detailed in the construction documents, shall be accompanied by pipe stress and end load calculations.
 - b. Calculations and proposed design documents, which show deviation from the construction documents, shall be prepared and sealed by a registered professional engineer, registered in the state of Tennessee, at the contractors expense.
6. The carbon steel pipe shall have either a factory applied HDPE or reinforced polyester (FRP) external cladding.
7. Fiberglass jacket:
 - a. All carrier pipes shall have a fiberglass over wrap that is minimum 0.10 inch thick. The carrier pipe shall be shot blasted to near white per SSPC-10 prior to installation of the jacket. The fiberglass jacket on the straight sections of pipe shall be manufactured in accordance with the following. The winding process shall be ASTM D-2996; the glass fiber shall be continuous E-glass fibers with a polyester compatible binder and coupling agent. The resin shall be polyester resin as manufactured by DOW Chemical or Ashland chemical. The winding pattern shall be no less than 58 degrees helix angle, using individually tensioned, and continuous single strand E-glass. The outer surface of the jacket shall have a resin veil applied. The glass to resin ratio shall be a minimum of 65/35.
 - b. The fittings shall be manufactured using a spray-up method, using polyester resin and randomly oriented chopped glass fibers. The resin shall be reinforced with a minimum 30% chopped glass fiber. The thickness of the spray-up fitting shall be a nominal of 1.5 times the filament wound jacket. The outer surface of the fitting jacket shall have a resin veil applied.
 - c. Field Joints: The hand lay-up process shall complete all field joints. The contractor shall wrap resin saturated glass mat onto the clean and dry surface of the pipe. The contractor shall roll out the glass mat to insure that no air gaps or bubbles are present. The contractor shall perform no work on the field joints when moisture is present. The minimum thickness of field hand lay-up shall be 0.10 inches.
8. HDPE Coating:
 - a. The HDPE coating shall be a three-layer pipe coating system involving:
 - 1) A fusion bonded-epoxy (FBE) primer
 - 2) An adhesive middle lay, and
 - 3) A polyethylene (HDPE) topcoat.The first layer of thermoset epoxy is applied as powder on a cleaned (shot blasted to near white per SSPC-10) and heated steel pipe. Both the adhesion layer and the topcoat are applied by extruding a sheet of molten polymer onto the heated pipe. The HDPE coating shall conform to ASTM D1248 and D3350, Type III, Category 5, Class 6, Grade P23/P24 with a minimum thickness of 150 mils.
 - b. The fittings for the HDPE coating shall be shot blasted and FBE powder coated, similar to the pipe. Liquid epoxy shall not be used. The second layer shall be polyethylene shrink tape and the top layer shall be polyethylene shrink sleeve. The total thickness shall be a minimum of 150 mils.

- c. The field joints for the HDPE system shall be jacketed with a minimum of two shrink sleeves. The first sleeve shall overlap the factory coating a minimum of 4 inches on each side and second shrink sleeve shall overlap the first shrink sleeve the same amount. The total thickness shall be a minimum of 150 mils.
- 9. All pipes shall be subjected to a "holiday" test using 35,000-volt electrical resistance holiday detector.
- 10. Generate field test reports for holiday testing in accordance with procedures defined in par, 1.5.B

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install piping systems per requirements of ANSI B31.9 and Section 15050, "Piping Systems".
- B. Welding: As required in Sections: 18100, "General Welding Requirements.
- C. When solder fittings are specified, use compression-type fittings to make connections to threaded valves and instruments.
- D. Use bends to minimize use of fittings. Group fittings required for racked tubing to simplify system leak testing.
- E. Run exposed and concealed tubing in horizontal and vertical planes. Run horizontal lines parallel to building walls and partitions.
- F. In areas with suspended ceilings, conceal horizontal tubing runs above ceilings.
- G. Do not embed tubing directly in concrete. Provide a sleeve made from conduit or pipe for tubing penetrations through concrete floors and walls.
- H. Identification/Labeling: Section 15074.

3.2 FIELD QUALITY CONTROL

- A. Pressure/Leak Test Section 15073, Class A.

3.3 CLEANING

- A. Post-installation Cleaning Sect. 15072, Type I.

END OF SECTION 15112